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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
DHINGRA, RAKESH KUMAR	

ART UNIT	PAPER NUMBER
1716	

NOTIFICATION DATE	DELIVERY MODE
12/01/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/578,184	OHMI ET AL.	
	Examiner	Art Unit	
	RAKESH DHINGRA	1716	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 November 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *3-7,10,14 and 15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *3-7,10,14,15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *04 May 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/16/2010 has been entered.

Response to Arguments

Applicant's arguments with respect to claims 1- 7, 10, and 12-16 have been considered but are moot in view of the new ground(s) of rejection as explained hereunder.

Applicant has amended claim 3 and 14 by adding new limitations, e.g. in claim 3 new limitations like a lattice like gas diffusion part including a vertical linear part and a horizontal linear part" have been added. Further applicant has cancelled claims 1, 2, 12, 13 and 16.

Accordingly claims 3-7, 10, 14 and 15 are now pending and active.

New reference by Fujikawa et al (US 5,595,606) when combined with Ohmi et al, Maruyama and Harano et al read on limitation of amended claim 3 including the newly added limitations. Accordingly claims 3-6, 10 and 15 have been rejected under 35 USC 103 (a) as explained below. Balance claims 7 and 14 have also been rejected under 35 USC 103 (a) as explained below. Regarding applicant's argument that for claim 3, the applied prior art even if modified would not make the claim obvious because, with no awareness of the problem (i.e., to cool the process gas supply part sufficiently without causing the cooling medium to flow through a complicated channel) or its solution, a person of skill in the art at the time of the invention

(with no awareness of the invention and no impermissible hindsight gained from Applicants' teachings) likely would have chosen a different modification, examiner responds that the newly cited reference of Fujikawa et al teaches a coolant passage 84 runs in a zig-zag manner in a gas supply part 62, amongst the gas supply holes. Fujikawa et al additionally teach that the coolant passage can be split into two portions to obtain improved cooling function relative to the lower face of the gas supply block 62 (e.g. Fig. 14) {e.g. Figs. 1, 6, 14 and col. 6, line 65 to col. 7, line 12 and col. 10, lines 54-62). Thus Fujikawa teaches that cooling efficiency could be improved by suitably configuring the coolant flow path in the process gas supply part. It would thus be obvious to optimize the flowing area of the cooling medium (coolant flow path) in the gas diffusion part in the apparatus of Ohmi et al in view of Maruyama, Fujikawa et al and Harano et al to obtain increased efficiency of cooling in the process gas supply part keeping in consideration the type of coolant used and the size of gas flow area in the process gas supply part.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various

claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 3-6, 10, 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohmi et al (US PGPUB 2003/0178144) in view of Maruyama (JP 02-55292) and Fujikawa et al (US 5,996,606) and Harano et al (US 2003/0126872).

Regarding Claim 3: Ohmi et al teach a plasma processor, comprising:

a processing vessel 11 having a holder 13 holding a substrate 12 to be processed;

a microwave antenna 20 provided on the processing vessel so as to oppose the substrate to be processed;

a processing gas supply part 31 provided between the substrate to be processed on the holder 13 and the microwave antenna 20 so as to oppose the substrate to be processed,

a lattice-like gas diffusion part 31.sub.1 including a vertical linear part and a horizontal linear part (claim limitations "vertical linear part" and "horizontal linear part" are interpreted to imply the mutually perpendicular lattice like diffusion members 31 in the process gas supply part 30 as shown in applicant's Figures 4A, 4B),

a plurality of first openings 31A through which plasma formed in the processing vessel passes, the first openings formed between the vertical linear part and the horizontal linear part of the gas diffusion part 31.sub.1,

a process gas channel 31B in the vertical linear part and the horizontal linear part of the gas diffusion part 31.sub.1 and connectable to a process gas source (through process gas inlet port 11r),

a plurality of second openings 31D communicating with the process gas channel 31B, and

a cooling medium channel 31e through which a cooling medium cooling the process gas supply part flows, the cooling medium channel being formed in one of the vertical linear part and the horizontal linear part of the gas diffusion part (41 – Fig. 10) so that the cooling medium flows in the gas diffusion part; and

Ohmi et al do not explicitly teach the cooling medium flows only in the one of the vertical linear part and the horizontal linear part in the gas diffusion part; a cooling medium circulator connected to the cooling medium channel and configured to circulate the cooling medium, wherein the cooling medium includes a cooling gas and mist of H20, and a pressure of the cooling medium channel is 0.2 to 1 MPa.

Maruyama teaches a substrate processing apparatus comprising a cooling arrangement for cooling an inner reaction tube 1 and wherein the cooling arrangement supplies a cooling medium to a cooling channel 6 and wherein the cooling medium includes a cooling gas (nitrogen), and water mist, a cooling medium mixer 14, 12 to generate and supply the cooling medium to the cooling medium channel (e.g. Figs. 1-3 and pages 6-10 of the English Translation attached). It would be obvious to use the cooling medium mixer that supplies a mixture of cooling gas and water mist, as taught by Maruyama in the apparatus of Ohmi et al to provide efficient cooling of the gas supply part. Further, Maruyama also teaches that the cooling water is supplied at a pressure of 2 Kg /cm2 (0.196 MPa = 0.2 MPa approx.). Thus the apparatus of Ohmi et al in view

of Maruyama would have a pressure of the cooling medium channel as 0.2 MPa (approx.) which is same as the start of the claimed pressure range of 0.2 to 1 MPa. It would be obvious to adjust the pressure of the cooling medium as per type of coolant used, size of the process gas supply part etc to obtain the predictable result of efficient cooling of the process gas supply part.

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to provide a cooling medium including a cooling gas and mist of water as taught by Maruyama in the apparatus of Ohmi et al to provide efficient cooling of the process gas supply part.

Ohmi et al in view of Maruyama do not explicitly teach the cooling medium flows only in the one of the vertical linear part and the horizontal linear part in the gas diffusion part; a cooling medium circulator connected to the cooling medium channel and configured to circulate the cooling medium.

Fujikawa et al teach a plasma apparatus comprising a process gas supply part 62 with gas supply holes 78 and a cooling medium channel 84 through which a cooling medium (like water or another coolant) may be passed to enable control temperature of the process gas supply part 62. Fujikawa et al further teach that the coolant passage 84 runs in a zig-zag manner amongst the gas supply holes. Fujikawa et al additionally teach that coolant passage can be split into two portions to obtain improved cooling function relative to the lower face of the gas supply block 62 (e.g. Fig. 14) {e.g. Figs. 1, 6, 14 and col. 6, line 65 to col. 7, line 12 and col. 10, lines 54-62). Thus Fujikawa teaches that cooling efficiency could be improved by suitably configuring the coolant flow path in the process gas supply part. It would be obvious to optimize the gas flowing area of the cooling medium (coolant flow path) in the gas diffusion part of the process gas supply part in the apparatus of Ohmi et al in view of Maruyama, in view of teaching of Fujikawa et al to

obtain increased efficiency of cooling in the process gas supply part keeping in consideration the type of coolant used and the size of gas flow area in the process gas supply part..

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to optimize the gas flowing area of the gas diffusion part (cooling medium flow path) in which the cooling medium should be made to flow as taught by Fujikawa et al in the apparatus of Ohmi et al in view of Maruyama to obtain increased efficiency of cooling keeping in view the type of coolant used and the size of gas flow area in the process gas supply part.

Ohmi et al in view of Maruyama and Fujikawa et al do not explicitly teach a cooling medium circulator connected to the cooling medium channel and configured to circulate the cooling medium.

However use of a circulator (heat exchanger) for circulating the cooling medium is known in the art as per reference cited hereunder.

Harano et al teach a wafer processing apparatus comprising a circulator connected to a cooling medium channel 21 and configured to circulate a cooling medium, and that includes a compressor 26 configured to compress the cooling medium and a tank 22 (reserve tank) that circulates (includes retains) the compressed cooling medium as per temperature and flow requirements (e.g. Fig. 1 and para. 0022 – 0034). It would be obvious to provide a cooling medium circulator as per teaching of Harano et al in the apparatus of Ohmi et al to control temperature of the process gas supplying part by using a recirculated cooling medium.

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to provide a circulator for circulating a cooling medium as taught by Harano et al in the apparatus of Ohmi et al in view of Maruyama and Fujikawa et al to control temperature of the process gas supplying part by using a recirculated cooling medium.

Regarding Claim 4: Harano et al teach the circulator includes heat exchangers 25, 29 for cooling the cooling fluid (Fig. 1 and para. 0022).

Regarding Claims 5, 6: Applicant has invoked 35 USC 112, 6th paragraph in respect of claim limitations –"cooling medium control means" for which the applicant's disclosed structure includes a mass flow controller /variable conductance valve 55 (Fig. 7 and page 23, line 10 to page 25, line 15), and regarding claim limitation "temperature measurement means" for which applicant has disclosed temperature sensor 57 (Fig. 7).

Harano et al teach the cooling medium circulator includes a temperature sensor 23, a temperature controlling device 34 and a coolant medium flow rate controlling device 40 such that flow rate of cooling medium is controlled based upon the sensed temperature (Harano et al – Fig. 1 and para. 0025-0032). Though Harano et al teach the temperature sensor 23 is located in the cooling medium channel 21, it would be obvious to rearrange its location so as to be located on the process gas supply part (rearrangement of parts) to enable control flow of the cooling medium more precisely, based upon temperature sensed at the process gas supply part itself.

Regarding Claim 10: Claim limitation regarding the cooling medium including SF6 pertains to contents of apparatus during intended operation of the apparatus and is not considered to add patentable weight.

In this regard courts have ruled:

Expressions relating the apparatus to contents thereof during an intended operation are of no significance in determining patentability of the apparatus claim. Ex parte Thibault, 164 USPQ 666, 667 (Bd. App. 1969).

Regarding Claim 15: Ohmi et al in view of Maruyama (JP 02-55292), Fujikawa et al and Harano et al teach temperature of the wall 1A of the inner tube (gas supply part) can be lowered

to 180 degrees C (which meets the claimed temperature of 100-200 degrees C) [Maruyama – page 9, first full paragraph].

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohmi et al (US PGPUB 2003/0178144) in view of Maruyama (JP 02-55292), Fujikawa et al (US 5,996,606) and Harano et al (US 2003/0126872) as applied to claims 3-6, 10, 15 and further in view of Paganessi (US 5,660,047).

Regarding Claim 7: Ohmi et al in view of Maruyama, Fujikawa et al and Harano et al teach all limitations of the claim (as already explained above under claims 3, 5, 6) including pressure of cooling medium is between 0.2 and 10 MPa, and a cooling medium control means that controls flow of cooling medium based upon temperature of the process gas supply part.

Ohmi et al in view of Maruyama, Fujikawa et al and Harano et al do not teach the cooling medium control means is a pressure control means for controlling pressure of the cooling medium.

Applicant has invoked 35 USC 112, 6th paragraph in respect of claim limitations –" cooling medium control means" for which the applicant's disclosed structure includes a mass flow controller /variable conductance valve 55 (Specification - Fig. 7 and para. 0090, 0097).

Paganessi teaches a plasma apparatus comprising a cooling control means that includes pressure control means 40 that controls the valves 14, 16, 24, 26 etc based on input from pressure sensors P and temperature sensors T (e.g. Fig. 1 and col. 4, lines 46-55). Paganessi also teach that cooling medium (nitrogen) is exhausted at a pressure of 30 psi to 100 psi (0.2 to 0.6 MPa). Thus the apparatus of Ohmi et al in view of Maruyama, Fujikawa et al, Harano et al and Paganessi is capable of controlling cooling medium pressure between 0.2 to 0.6 MPa which

nearly meets the claimed pressure range of 0.2 to 1 MPa. Further, though Paganessi do not explicitly teach that the temperature control means controls temperature of the process gas supplying part it would be obvious to provide the same for obtaining temperature control of process gas supplying part based on the temperature measured by the temperature measurement means in view of teaching of Harano et al as explained above under claims 3, 5 and 6.

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to provide pressure control as the cooling medium control means as taught by Paganessi in the apparatus of Ohmi et al in view of Maruyama, Fujikawa et al and Harano et al as a known means to control temperature of the process gas supplying part.

In this regard courts have ruled:

The selection of a known material based on its suitability for its intended use is prima facie obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945).

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohmi et al (US PGPUB 2003/0178144) in view of Maruyama (JP 02-55292), Fujikawa et al (US 5,996,606) and Harano et al (US 2003/0126872) as applied to claim 3-6, 10 and further in view of Hillman (US 5,997,649).

Regarding Claim 14: Ohmi et al in view of Maruyama, Fujikawa et al and Harano et al teach all limitations of the claim but do not teach the process gas supply part is attached to the processing vessel through a heat insulating part and the heat insulating part includes two components and the two components increase a thermal resistance between the processing vessel and the process gas supply part.

Hillman teaches a plasma apparatus wherein a process gas supply part 44 is attached to a processing vessel 12 through a heat insulating part and the heat insulating part includes two components 50, 52 such that the two components increase a thermal resistance between the processing vessel and the process gas supply part (e.g. Fig. 1 and col. 9, lines 42-55).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to attach the process gas supply part to the processing vessel by an insulating part that includes tow components as taught by Hillman in the apparatus of Ohmi et al in view of Maruyama, Fujikawa et al and Harano et al to increase a thermal resistance between the processing vessel and the process gas supply part and minimize heat loss to the processing vessel from the process gas supply part and enable maintain the process gas supply part at a desired temperature as per process limitations like type of gas, gas flow rate etc.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RAKESH DHINGRA whose telephone number is (571)272-5959. The examiner can normally be reached on 8:30 - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/RAKESH DHINGRA/
Examiner, Art Unit 1716